

## NEW RECORDS OF EPHEMEROPTERA FROM MEXICO<sup>1</sup>

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ABSTRACT: Twenty-seven species and six genera of mayflies (Ephemeroptera) are reported from Mexico for the first time. Twenty-four species and the genera *Ephemerella*, *Ironodes*, *Paraleptophlebia*, and *Siphonurus* were previously known from north of Mexico, four species and the genus *Moribaetis* were previously known from Central America, and one species and the genus *Paracloeodes* were previously known from north of Mexico and Central America. *Callibaetis punctilusus* McCafferty and Provonsha, new status, is raised to specific rank. Comments on the distributional significance of each of the new species records are included.

The Ephemeroptera fauna of Mexico has been poorly known. Prior to this report, only 83 species in the following genera were recorded: *Acentrella* Bengtsson, *Acerpenna* Waltz and McCafferty, *Baetis* Leach, *Baetodes* Needham and Murphy, *Callibaetis* Eaton, *Caenis* Stephens, *Camelobaetidius* Traver and Edmunds, *Campsurus* Eaton, *Choroterpes* Eaton, *Cloeodes* Traver, *Drunella* Needham, *Euthyplocia* Eaton, *Fallceon* Waltz and McCafferty, *Hexagenia* Walsh, *Homoeoneuria* Eaton, *Hydrosmilodon* Flowers and Domínguez, *Iron* Eaton, *Isonychia* Eaton, *Lachlania* Hagen, *Leptohyphes* Eaton, *Neochoroterpes* Allen, *Nixe* Flowers, *Rhithrogena* Eaton, *Serratella* Edmunds, *Stenonema* Traver, *Thraulodes* Ulmer, *Traverella* Edmunds, and *Tricorythodes* Ulmer. To these we add 27 species and the following genera: *Ephemerella* Walsh, *Ironodes* Traver, *Moribaetis* Waltz and McCafferty, *Paracloeodes* Day, *Paraleptophlebia* Lestage, and *Siphonurus* Eaton.

McCafferty *et al.* (1992) treated the biogeography of those genera found in Mesoamerica, and their study was applicable to Mexico. They hypothesized that *Baetodes*, *Camelobaetidius*, *Campsurus*, *Cloeodes*, *Euthyplocia*, *Fallceon*, *Homoeoneuria*, *Lachlania*, *Leptohyphes*, *Moribaetis*, *Paracloeodes*, *Thraulodes*, *Traverella*, and *Tricorythodes* have a recent Neotropical center of dispersal, whereas *Hexagenia* s. s., *Iron*, *Isonychia*, *Nixe*, *Rhithrogena*, and *Stenonema* have a Nearctic one. *Caenis* was hypothesized to be comprised of elements from the Nearctic and Neotropics (McCafferty *et al.* 1992). Flowers and Domínguez (1992) showed the Neotropical affinities of *Hydrosmilodon*. Lugo-Ortiz and McCafferty (1993) indicated that *Acerpenna* might have a Neotropical origin. *Acentrella*, *Choroterpes*, *Drunella*, *Ephemerella*, *Ironodes*,

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*Paraleptophlebia*, *Serratella*, and *Siphonurus* have evident Nearctic affinities. *Baetis* thus far appears to be comprised of elements derived from Nearctic lineages (Lugo-Ortiz and McCafferty 1993). Available data regarding *Callibaetis* and *Neochoroterpes* are still too inconclusive to determine affinities. Below, we provide the new distributional records from Mexico and comment on their significance. Except where otherwise noted, the materials upon which these records are based are housed in the Purdue Entomological Research Collection (West Lafayette, IN).

## BAETIDAE

### *Baetis flavistriga* McDunnough

**Records.** CHIHUAHUA.—Río Gavilán, Los Amarillos, VI-23-1987, B. Kondratieff and R. W. Baumann (larvae); Río Gavilán, Gavilán, Ranch, VIII-25-1986, B. C. Kondratieff (male adults).

**Remarks.** *Baetis flavistriga* (*fusatus* group) is a common species in eastern North America (McCafferty and Waltz 1990). Recently, McCafferty and Davis (1992) and McCafferty *et al.* (1993) reported it from Texas and Colorado.

### *Baetis magnus* McCafferty and Waltz

**Records.** CHIAPAS.—Tapachula, VII-20-1966, R. K. Allen (larvae). CHIHUAHUA.—Río Nuevo Casas Grandes, above Casas Grandes, I-18-1987, B. C. Kondratieff (larvae); Arroyo Fresas, 3 mi above Río Piedras Verdes, VI-22-1987 (larvae). DURANGO.—La Michilia, Arroyo Temazcal, IV-15-1987, R. Novelo (larvae, deposited at the Instituto de Ecología, A. C.); La Michilia, Arroyo Temazcal, IX-15-1987, R. Novelo and E. González (larvae, deposited at the Instituto de Ecología, A. C.). MEXICO.—Rd to Cotula, VII-5-1965, A. Ortiz (larva). NUEVO LEON.—Río Ramso, XII-20-1939, L. Berner (larva). MORELOS.—Jojutla, Vicente Aranda, Río Amacúzac, 800 m, IV-16-1987, R. Novelo and E. González (larvae, deposited at the Instituto de Ecología, A. C.). OAXACA.—Portillo del Rayo, Río en Finca El Encanto, bosque de niebla, 1200 m, R. Novelo, IX-27-1988 (larva, deposited at the Instituto de Ecología, A. C.). SAN LUIS POTOSÍ.—Stream, nr 1 mi from Catorce W of Motehuala, V-30-1986, B. C. Henry (larvae, deposited at the Instituto de Ecología, A. C.). VERACRUZ.—Tlapacoyán, Río Tomata, X-10-1984, G. Zapién (larvae); Culinavara, I-1-1948 (larva).

**Remarks.** *Baetis magnus* (*rhodani* group) is the only member of the genus thus far known to be represented in the Nearctic and Neotropical regions. Lugo-Ortiz and McCafferty (1993) recently reported it from Costa Rica and Guatemala. It has a western North American distribution extending as far north as western Nebraska (McCafferty and Waltz 1986, 1990). Its presence throughout most of Mexico was to be expected.

### *Baetis notos* Allen and Murvosh

**Records.** VERACRUZ.—Culinavara, I-1-1948 (larva).

**Remarks.** *Baetis notos* (*rhodani* group) was previously known from Arizona, Colorado, New Mexico, and Texas [Morihara and McCafferty

(1979) as *B. sp. C*; Allen and Murvosh (1987); McCafferty and Davis (1992); McCafferty *et al.* (1993)]. The species should occur in the northern half of Mexico, and it will probably prove to have a distribution similar to that of *B. magnus*.

### *Baetis tricaudatus* Dodds

**Records.** BAJA CALIFORNIA NORTE.—Arroyo Potrero, Rancho Potrero, 1-16-1988, B. C. Kondratieff and R. W. Baumann (larvae); Mike's Sky Rancho, Río San Rafael, 1-15-1988, B. C. Kondratieff and R. W. Baumann (larvae); Río Santo Domingo, V-17-1936, P. R. Needham (larvae).

**Remarks.** Allen and Murvosh (1987) described *B. sonora* from a small series of larvae from Sonora. McCafferty and Waltz (1990) recognized that species as a junior synonym of *B. tricaudatus*; however, R. D. Waltz (pers. comm.), after examining the type material of *B. sonora*, has indicated to us that it is referable to *Fallceon quilleri* (Dodds), and *B. tricaudatus*, therefore, had not been correctly reported from Mexico. Given the widespread distribution and ubiquitous nature of *B. tricaudatus* in North America (McCafferty and Waltz 1990), its presence in Mexico was to be expected.

### *Callibaetis californicus* Banks

**Records.** GUERRERO.—Km 15, Carretera Bejucos, nr Ciudad Altamirano, XI-22-1984 (larvae, deposited at the Universidad Nacional Autónoma de México). MORELOS.—Jojutla, Vicente Aranda, Río Amacúzac, 800 m, II-12-1983, S. Ibáñez (larvae, deposited at the Instituto de Ecología, A. C.). NUEVO LEON.—4 mi S of Monterrey, XII-28-1947, S. Mulaik (larvae); 10 mi N of Monterrey, Sabinas Hidalgo, XII-25-1947, S. Mulaik (larvae).

**Remarks.** Previous to this report, McCafferty and Davis (1992) provided the southeasternmost records of *C. californicus* from Texas. The new records represent a considerable southward extension of its known range into the Neotropical region.

### *Callibaetis floridanus* Banks

**Records.** GUERRERO.—Km 15 carretera Bejucos, nr Ciudad Altamirano, XI-22-1984 (female adults, deposited at the Universidad Nacional Autónoma de México). MORELOS.—Jojutla, Vicente Aranda, Río Amacúzac, 800 m, Arroyo Corralitos, km 15 carretera Suchil-San Juan Michis, IV-16-1987, R. Novelo and E. González (larvae, deposited at the Instituto de Ecología, A.C.). NUEVO LEON.—Anáhuac, Laguna Salinillas, XI-14-1985, H. Rojas, R. Baroa, and S. Tufino (female adults, deposited at the Universidad Nacional Autónoma de México).

**Remarks.** *Callibaetis floridanus* was previously known from southeastern North America west to Texas (McCafferty and Waltz 1990; McCafferty and Davis 1992). The present records considerably extend its known range southward into the Neotropics.

### *Callibaetis punctilulus* McCafferty and Provonsna, NEW STATUS

**Records.** CHIAPAS.—San Cristobal de las Casas, V-5-1979, J. Bueno y Soria (male adult, deposited at the Universidad Nacional Autónoma de México). NUEVO LEON.—

Anahuac, Laguna Salinillas, XI-14-1985, H. Rojas, R. Baroa, and S. Tufiño (male adult, deposited at the Universidad Nacional Autónoma de México).

**Remarks.** McCafferty and Provonsha (1993) described *C. montanus punctilusus* from a small series of male and female adults from south-eastern Texas. The present records represent a significant southward extension of its known range, and indicate that it overlaps with that of *C. montanus montanus* throughout Mexico. We therefore recognize *C. montanus* and *C. punctilusus* as separate species. Given its apparent restricted distribution in southwestern United States and widespread distribution in Mexico, *C. punctilusus* probably has Neotropical affinities.

### *Camelobaetidius trivialis* (Allen and Chao)

**Records.** SONORA.—Río Chico, above El Chico, I-18-1988, B. C. Kondratieff and R. W. Baumann (larvae).

**Remarks.** *Camelobaetidius trivialis* is strikingly similar to *C. warreni*, and it may prove to be equivalent to that species upon further examination. However, we are tentatively assigning the Sonoran larvae to *C. trivialis* since the shape of segments 2 and 3 of the labial palps and the setation on the labrum do not correspond to the descriptions and figures provided by Traver and Edmunds (1968) for *C. warreni*, and the abdominal coloration resembles that described for *C. trivialis*. *Camelobaetidius trivialis* was previously known from Arizona and New Mexico (Allen and Chao 1978a).

### *Camelobaetidius warreni* (Traver and Edmunds)

**Records.** BAJA CALIFORNIA SUR.—Río Calamajue. CHIAPAS.—Ocosingo Valley, tributary of Río Santa Cruz, VII-1-7-1950, Goodnight and Stannard (larva). CHIHUAHUA.—Río Gavilán, Gavilán Ranch, VIII-26-1986, B. C. Kondratieff (male adult). GUERRERO.—Km 15 carretera Bejucos, nr Ciudad Altamirano, XI-22-1984, Brailovsky *et al.* (larvae, deposited at the Universidad Nacional Autónoma de México). OAXACA.—Dominguillo, III-8-1978, H. Zapién (larvae, deposited at the Universidad Nacional Autónoma de México). SONORA.—Hwy 11, SW of Tezopuco, I-18-1988, B. C. Kondratieff and R. W. Baumann (larvae); Río Yaqui, nr Tonichi, IV-25-1982, D.A. and J. T. Polhemus (larvae).

**Remarks.** *Camelobaetidius warreni* was previously known from west-central California and southern Colorado (Traver and Edmunds 1968; McCafferty *et al.* 1993). The present records represent a considerable southward extension of its known range. The species appears to extend south along the western states via the Sierra Madre Occidental, and may be widespread in Mexico.

### *Cloeodes excogitatus* Waltz and McCafferty

**Records.** UNKNOWN STATE.—R. K. Allen (larvae).

**Remarks.** *Cloeodes excogitatus* was previously known only from the type locality in Arizona (Waltz and McCafferty 1987). Unfortunately, we do not have any data regarding the locality, other than Mexico, where the present specimens were collected. A reconstruction of the col-

lector's itinerary, however, indicates that these were collected from one of the following states: Mexico, Morelos, Oaxaca, or Puebla. If that is in fact the case, then it would represent a considerable southward extension of the range of this species, indicating that it occurs somewhat continuously along the west coast of Mexico, probably via the Sierra Madre Occidental.

### *Cloeodes macrolamellus* Waltz and McCafferty

**Records.** CHIHUAHUA.—Small stream 12 mi W. of Tomóchic, 1-20-1987, B. C. Kondratieff (larva). DURANGO.—La Michilia, Arroyo Taray, IV-14-1987, R. Novelo and E. González (larvae, deposited at the Instituto de Ecología, A. C.).

**Remarks.** *Cloeodes macrolamellus* was previously known only from the type locality in New Mexico (Waltz and McCafferty 1987). The new records significantly extend its known range southward. Apparently, the species occurs somewhat continuously along the Sierra Madre Occidental, but is probably more widespread in Mexico and could also occur in Central America.

### *Moribaetis macaferti* Waltz

**Records.** CHIAPAS.—Stream at Santa Isabel, 12 mi above Arriaga on Hwy 190, 2000 ft, 73°F, X-23-1968, R. K. Allen (larvae); Río Teapa nr Ishuatán, 650 ft, VII-18-1966, R. K. Allen (larvae); Stream 7 mi N of Arriaga on Hwy 190, 1400 ft, VII-20-1966 (larvae). OAXACA.—Portillo del Rayo, Río en Finca El Encanto, Bosque de niebla, 1200 m, R. Novelo, IX-27-1988 (larva, deposited at the Instituto de Ecología, A. C.); La Esperanza, III-23-1984, G. Zapién (larva). VERACRUZ.—Río Tecolapán, nr Santiago Tuxtla on Hwy 80, VII-16-1966, R. K. Allen (larvae); Río San Marcos at Apapantilla, 3 mi SE of Villa A. Camacho, 700 ft, 66°F, XI-12-1968 (larvae); Stream 5 mi S of Ciudad Mendoza, 4500 ft, XII-7-1968, R. K. Allen (larvae); Metlac, XII-26-1940, L. Berner (larvae); XII-25-1940, Berner (larvae); XII-26-1940, L. Berner (larvae).

**Remarks.** Previous to this report, *M. macaferti* was known from Guatemala and Costa Rica (Waltz and McCafferty 1985). The records from Veracruz suggest the probability that *M. macaferti* occurs in the southern reaches of the Nearctic region, since they are near Poza Rica, the northernmost limit of the Neotropical region according to McCafferty *et al.* (1992). Of interest to us was the fact that some of the Mexican larvae lack the procoxal osmobranchia, but their other characters are consistent with the description of Waltz and McCafferty (1985).

### *Paracloeodes minutus* (Daggy)

**Records.** BAJA CALIFORNIA SUR.—Arroyo San Pedro, 19 mi W of Hwy 1, VI-27-1988, B. C. Kondratieff (male adults).

**Remarks.** *Paracloeodes minutus* is a widespread species extending from Minnesota south to Texas and west to California (Daggy 1945; Day 1955; McCafferty and Davis 1992). The species is probably widespread throughout Mexico.

## CAENIDAE

*Caenis anceps* Traver

**Records.** VERACRUZ.—Metlac, XII-26-1940, L. Berner (male adult).

**Remarks.** *Caenis anceps* has a primarily eastern North American distribution, with southwesternmost records from mountainous Arkansas; and southeastern Oklahoma (McCafferty and Provonsha 1978; Provonsha 1990). This considerable range extension suggests that it is a Nearctic element of *Caenis* reaching the Neotropics.

## EPHEMERELLIDAE

*Ephemerella altana* Allen

**Records.** BAJA CALIFORNIA NORTE.—Río San Rafael, Sierra San Pedro Mártir, Mike's Sky Rancho, VI-22-1988, B. C. Kondratieff (larvae).

**Remarks.** Previously, *E. altana* was known from Arizona and New Mexico (Allen 1968). The species may occur in other states of northern Mexico.

## EPHEMERIDAE

*Hexagenia albivitta* (Walker)

**Records.** VERACRUZ.—Mendoza, VI-24-1965, C. S. Martell (male subimagos).

**Remarks.** Prior to this report, McCafferty (1970) provided the northernmost records of *H. albivitta* from Costa Rica. The present record considerably extends its known range and suggests that it is more widespread in Central America. Four species of *Hexagenia* are now known from Mexico: *H. albivitta*, *H. bilineata* (Say), *H. limbata* (Serville), and *H. mexicana* Eaton.

## HEPTAGENIIDAE

*Ironodes nitidus* (Eaton)

**Records.** BAJA CALIFORNIA NORTE.—Sierra San Pedro Mártir, headwaters of Arroyo San Antonio, below entrance to National Park, I-16-1988, B. C. Kondratieff (larvae).

**Remarks.** The larvae of *I. nitidus* have not been formally described. However, the present specimens key out to this species in Traver's (1935) key to the larvae of *Ironodes*. We are therefore assigning them to *I. nitidus*. The species was previously known from California and Oregon (Eaton 1885).

*Rhithrogena morrisoni* (Banks)

**Records.** BAJA CALIFORNIA NORTE.—Río San Rafael, Mike's Sky Rancho, I-15-1988, B. C. Kondratieff (larvae).

**Remarks.** Although the larvae of *R. morrisoni* have not been formally described, Allen and Chao (1978b) included the species in their larval key to the southwestern North American species of *Rhithrogena*. The present record is based on that key. Previous to this report, *R. mor-*

*risoni* was known to occur from Alberta south to Arizona and New Mexico (McDunnough 1934; Allen and Chao 1978b).

#### LEPTOPHLEBIIDAE

##### *Paraleptophlebia memorialis* (Eaton)

**Records.** BAJA CALIFORNIA NORTE.—Río San Rafael, Mike's Sky Rancho, 1-15-1988, B. C. Kondratieff (larvae).

**Remarks.** *Paraleptophlebia memorialis* has been known from Alberta and British Columbia south to Arizona and New Mexico (McDunnough 1926b, 1928; Kilgore and Allen 1972). The species may occur in other states of northern Mexico.

##### *Thraulodes zonalis* Traver and Edmunds

**Records.** CHIAPAS.—Río Lacán-Ha, km 22.5 carretera Agua Azul-Ocotzingo, nr Palenque, VII-22-1978, J. Bueno and J. Padilla (larvae, deposited at the Universidad Nacional Autónoma de México).

**Remarks.** *Thraulodes zonalis* has a widespread distribution in Central America, extending from Panama to Belize (Traver and Edmunds 1967; Allen and Brusca 1978; McCafferty 1985). The present record from Chiapas was expected, and it is probable that the species occurs farther north in Mexico.

#### OLIGONEURIIDAE

##### *Lachlania powelli* Edmunds

**Records.** GUERRERO.—Km 15 carretera Bejucos, nr Ciudad Altamirano, XI-22-1984 (larva, deposited at Universidad Nacional Autónoma de México).

**Remarks.** *Lachlania powelli* was previously known only from Utah (Edmunds 1951). The present record significantly shows that it extends into the Neotropics. Koss and Edmunds (1970) suggested that *L. powelli* might be synonymous with *L. saskatchewanensis* Ide. McCafferty *et al.* (1993) recently found the latter species in Colorado, and suggested the same possibility. If *L. powelli* is indeed a junior synonym of *L. saskatchewanensis*, then it has a wide distribution extending from Saskatchewan south to Guerrero.

#### SIPHLONURIDAE

##### *Siphonurus occidentalis* (Eaton)

**Records.** CHIHUAHUA.—Arroyo Lalo Varela, tributary of Río Gavilán, VI-22-1987, B. C. Kondratieff and R. W. Baumann (male and female adults); Spring at Rancho Salmón, VI-23-1987, B. C. Kondratieff and R. W. Baumann (exuviae). SONORA.—Yécora, at lights, VIII-21-1986, B. C. Kondratieff (exuviae and male and female subimagos).

**Remarks.** *Siphonurus occidentalis* was previously known from Alberta south to Arizona and New Mexico (McDunnough 1928; Traver 1935; Peters and Edmunds 1961; Allen and Chao 1981). Its presence in Chihuahua and Sonora was to be expected.

## TRICORYTHIDAE

*Leptohyphes apache* Allen

**Records.** CHIHUAHUA.—Small stream S of Pacheco, 1-22-1987, B. C. Kondratieff (larva).

**Remarks.** *Leptohyphes apache* was previously known from Arizona, New Mexico, and Utah (Allen 1967). Its presence in northern Mexico was to be expected.

*Leptohyphes castaneus* Allen

**Records.** OAXACA.—Portillo del Rayo, Río en Finca El Encanto, cloud forest, 1200 m, IX-28-1988 (larvae).

**Remarks.** This species was known only from the type locality in Guatemala (Allen 1967). Its presence in southern Mexico was to be expected.

*Leptohyphes michaeli* Allen

**Records.** NUEVO LEON.—Santiago, XII-20-1939, L. Berner (larva).

**Remarks.** Previous to this report, *L. michaeli* was known only from the type locality in Texas (Allen 1978). Its presence in northern Mexico was to be expected.

*Tricorythodes condylus* Allen

**Records.** CHIHUAHUA.—Río Gavilán, Los Amarillos, VI-23-1987, B. C. Kondratieff and R. W. Baumann (larva). SONORA.—Río Chico, above El Chico, B. C. Kondratieff and R. W. Baumann (larva).

**Remarks.** *Tricorythodes condylus* was previously known from Arizona and New Mexico (Allen 1967; Kilgore and Allen 1973). It is possible that *T. condylus* is widespread in the northern half of Mexico.

*Tricorythodes dimorphus* Allen

**Records.** CHIHUAHUA.—7 mi N of Basaseachic, IV-27-1982, D. A. Polhemus (larva)

**Remarks.** This species was previously known from Arizona and New Mexico (Allen 1967; Kilgore and Allen 1973). Its presence in Chihuahua was expected, and the species probably occurs in other states of northern Mexico.

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